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Keys to the Iowa Species of *Calvatia* and *Lycoperdon*

By JASPER H. B. GARNER

The starting point in the nomenclature of the Gasteromycetes is Persoon's *Synopsis Methodica Fungorum* of 1801. Many of the specimens on which Persoon based his descriptions are in his herbarium, which is now in the Rijksherbarium at Leiden, Netherlands. Perdeck (1950), as a result of his study of Persoon's herbarium, made some name changes in an attempt to clear up some of the nomenclatorial confusion existing in the Lycoperdaceae. In a previous paper Garner (1955) incorporated these changes in making a revision of the genera *Calvatia* and *Lycoperdon* as treated by Kambly and Lee (1936) in "The Gasteromycetes of Iowa". The following keys incorporate these name changes.

This work was done in the mycological laboratories of the State University of Iowa under the direction of Professor G. W. Martin.

- I. CALVATIA Fries, Summa Veg. Scand. 2:442. 1849. emend. Morgan, Jour. Cin. Soc. Nat. Hist. 12:165. 1890. nomen cons.
Langermannia Rostk., in Sturm, Deuts. Fl. 3 (3):23. 1839.
Hippoperdon Mont., Ann. Sci. Nat. II. 17:121. 1848.
Globaria Quél., Mém. Emul. Montbéliard Suppl. II. 361. 1873
Utraria Quél., Mém. Soc. Emul. Montbéliard Suppl. II. 357. 1873.

Basidiocarp large to very large, globose, flattened or pyriform, with or without a thick, stalk-like sterile base; outer peridium a thin adherent layer, often smooth; inner peridium thin, very fragile, after maturity breaking up into fragments from above downward and gradually falling away; subgleba sterile, concave above, long persistent, sometimes poorly developed; capillitium composed of long much-branched threads which at maturity, in most species, are easily broken up into short pieces, mostly narrower than the spores; spores globose, small, usually sessile, but sometimes with a short pedicel.

Readily distinguishable from *Lycoperdon* by the irregular scaling away of the peridium at maturity and in most cases by the fragility of the capillitium.

Langermannia Rostk. 1839 is the oldest effectively published name for this genus. *Hippoperdon* Mont. 1842, also, is earlier than the name *Calvatia* Fr. 1849, which is conserved according to the International Code of Botanical Nomenclature, p. 77, 1952.

Key to the species of CALVATIA

- a. Basidiocarp large
(15-45 cm in diameter), sessile,
without a prominent base..... 1. *C. gigantea*.

- a. Basidiocarp usually 15 cm or less in diameter; if over 15 cm, then with prominent sterile base.....b.
- b. Basidiocarp sessile, without a prominent sterile base; subgleba almost lacking..... 2. *C. pachyderma*
- b. Basidiocarp with a stout, thick base; subgleba sharply defined and usually concave above, persistentc.
- c. Subgleba separated from the gleba by a well-defined diaphragm.....d.
- c. Subgleba present but not separated from the gleba by a diaphragm.....e.
- d. Outer peridium smooth, slightly scaly, thin and fragile, at maturity breaking up and exposing the pale to dark purplish gleba..... 3. *C. cyathiformis*
- d. Outer peridium of thick floccose warts or spines; gleba yellowish green..... 4. *C. caelata*
- e. Mass of spores and capillitium bright ochre; peridium plicate beneath, outer peridium represented by a delicate furfurescence..... 5. *C. rubro-flava*
- e. Mass of spores and capillitium olivaceous or brownish; outer peridium a thin persistent granular or powdery layer, or in some instances scaling off in small areas.....f.
- f. Mass of spores and capillitium brown; spores minutely to strongly warted, 4.5-5.5 μ in diameter, usually with a short pedicel..... 6. *C. excipuliiformis*
- f. Mass of spores and capillitium olivaceous; spores smooth, 3-3.5 μ in diameter, bearing a short pedicel..... 7. *C. craniiformis*
- II. LYCOPERDON Pers., Syn. Fung. 140. 1801, emend, Rostk. in Sturm, Deutschl. Fl. 3:2. 1839.
Utraria Quél. Bull. Soc. Myc. Fr. 24:366. 1876.

Basidiocarp globose or depressed-globose, pyriform, turbinate or broadly turbinate; base in many species filled with a sterile honeycomb tissue; peridium usually of two well-defined layers; outer peridium usually consisting of spines or very minutes hairs, warts, scales or granules, more or less fugacious; spines frequently converging at their apices to form stellate groups; inner peridium thin, papery and flaccid, opening by a definite apical mouth; capillitium usually branched, main branches about the diameter of the spores; spores globose or rarely elliptical, commonly warted or spiny, usually with a short or long pedicel.

The name *Lycoperdon* was first used in this restricted sense (omitting the species now placed under *Calvatia*) by Rostkovius and not by Morgan, as is usually assumed.

Key to the species of *LYCOPERDON*

- a. Mass of spores and capillitium at first olivaceous, then violaceous, finally purplish brown at maturity; spores globose, distinctly warted, mostly more than 5μ in diameter.....b.
- a. Mass of spores and capillitium at first greenish yellow, then olivaceous, finally brownish olivaceous or brown, without a purplish tint at maturity; spores smooth or minutely warted, globose and mostly less than 5μ in diameter or oval with long pedicels (*L. pedicellatum*) or elliptic (*L. oblongosporum*).....f.
- b. Outer peridium a thin, smooth layer becoming rimulose, then appressed-scaly; spores $6.5-7.6\mu$, with large warts..... 1. *L. rimulatum*
- b. Outer peridium of long or short spines; if not spiny, furfuraceous.....c.
- c. Outer peridium furfuraceous at maturity..... 2. *L. elegans*
- c. Outer peridium of long or short spines, not furfuraceous.....d.
- d. Outer peridium of stellately clustered, short spines or of granules, often with combinations of both..... 3. *L. molle*
- d. Outer peridium of long, slender, curved and convergent spines, the upper ones 3-6mm in length.....e.
- e. Outer peridium of long, white, slender, convergent spines, the upper ones 4-6 mm in length; inner peridium reddish or purplish brown; basidiocarp obovoid with a thick cord-like root..... 4. *L. pulcherrimum*
- e. Outer peridium of long, dark-colored spines, the upper ones 3-6 mm in length; inner peridium reticulate in appearance after the falling off of spines..... 5. *L. echinatum*
- f. Subgleba well developed, usually one-fifth or more of the basidiocarp.....g.
- f. Subgleba obsolete or nearly so, if present, compact, not cellular.....n.
- g. Outer peridium of small, crowded warts or a smooth, finely granular or mealy coat, not bearing distinct spines.....h.
- g. Outer peridium of short or long spines or thick, terete warts.....i.
- h. Basidiocarps mostly lignatile; subgleba white to pale brown, at maturity always paler than the gleba..... 6. *L. pyriforme*
- h. Basidiocarps most terrestrial; subgleba dark brown or purplish at maturity, never paler in color than the gleba..... 7. *L. spadiceum*
- i. Spores sub-globose to broadly oval, ($3.5-4.5 \times 4-5\mu$ in diameter), smooth, with long, persistent pedicels..... 8. *L. pedicellatum*
- i. Spores globose with minute pedicels or non-pedicellatej.

- j. Inner peridium white-spotted, reticulate after falling away of stout spines or warts..... 9. *L. perlatum*
- j. Inner peridium not appearing white-spotted and reticulate after falling away of spines.....k.
- k. Outer peridium of white, stout, convergent spines which fall away in large plats or patches.....10. *L. candidum*
- k. Outer peridium of dehiscent spines which fall away separately.....l.
- l. Outer peridium a soft coat of minute spines with intermingled granules.....11. *L. muscorum*
- l. Outer peridium of long, curved and convergent spines, sometimes with intermingled smaller spines.....m.
- m. Basidiocarp covered with tapering spines (spines lavender in color till maturity); with a distinct stalk up to 3 cm long; capillitium thick-walled.....12. *L. Peckii*
- m. Basidiocarp covered with crowded spines united by their tips into stellate groups; sessile; capillitium thin-walled, hyaline, septate.....13. *L. Curtisii*
- n. Spores elliptical, smooth, 5-6 x 3.5-4.5 μ14. *L. oblongosporum*
- n. Spores globose, smooth or minutely warted.....o.
- o. Spores smooth with permanent, acuminate pedicels; basidiocarp small.....15. *L. echinellum*
- o. Spores smooth or minutely warted, without permanent pedicels.....p.
- p. Basidiocarp up to 8mm, subgleba absent; spores smooth.....16. *L. acuminatum*
- p. Basidiocarp larger than 8mm, subgleba, when present, compact; spores minutely warted (occasionally smooth.....17. *L. ericetorum*

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